

Minutes of Meeting

| Date held: September 23, 2010 | Time held: 8:30am-3:00pm | Location held: Toronto Congress Center |
|--|---------------------------------|---|
| Invited/Attended | Company Name | Attendance Status (A)ttended; (R)egrets; (S)ubstitute |
| Bruce Power | Loughren, Chris | Attended |
| Canadian Wind Energy Association | Levy, Tom | Teleconference |
| Canadian Wind Energy Association | Rangooni, Justin | Teleconference |
| Elenchus Research Associates for Power Workers Union | Hassan, Fred | Attended |
| Enercon | Fischer, Markus | Attended |
| Environment Canada | Besner, Serge | Attended |
| Erie Shores | Cary, Rob | Attended |
| Garrad Hassan Canada Incorporated | Tremblay, Martin | Attended |
| Greater Sudbury Hydro | McMillan, Brian | Attended |
| Hydro One Networks Incorporated | Behal, Gaurav | Attended |
| Hydro One Networks Incorporated | Boudreau, Ryan | Attended |
| Hydro One Networks Incorporated | Chan, William | Attended |
| Hydro One Networks Incorporated | Garg, Ajay | Attended |
| Hydro One Networks Incorporated | Nelles, Paul | Attended |
| Hydro One Networks Incorporated | Savulak, Jason | Attended |
| Hydro One Networks Incorporated | Singh, Bob | Attended |
| Invenergy Canada | Murphy, James | Teleconference |
| Invenergy LLC rep Raleigh Wind Energy Centre | Goldstein, Michael | Teleconference |
| McMaster University | Tang, Chi | Attended |
| Ministry of Energy | Jenkins, Allan | Attended |
| Natural Resources Canada | Dignard, Lisa | Teleconference |
| Natural Resources Canada | Pelland, Sophie | Attended |
| New Paradigm Capital Forp | Goldberger, Dan | Attended |
| NextEra Energy Resources | Romaniuk, Oliver | Attended |
| Ontario Energy Board | Reid, Laurie | Attended |
| Ontario Power Authority | Dick, Kevin | Attended |
| Ontario Power Authority | Garner, Tracy | Attended |
| Ontario Power Authority | Li, Jennifer | Attended |
| Ontario Power Authority | Nusbaum, Stephen | Attended |
| Ontario Power Authority | Pessione, George | Attended |

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| Ontario Power Generation | Sikstrom, Matt | Attended |
| Private Consultant | Lindsay, Gary | Attended |
| Samsung Renewable Energy | Mawani, Zohrab | Attended |
| SunEdison | Simmons, Sarah | Attended |
| TC Energy | Kuntz, Margaret | Attended |
| Tom Adams Energy | Adams, Tom | Attended |
| Toronto Hydro Electric System Limited | Thompson, Gary | Attended |
| Tribute Resources Incorporated | Budd, Peter | Attended |
| Tribute Resources Incorporated | Butler, Chris | Attended |
| Tribute Resources Incorporated | Lewis, Jennifer | Attended |
| University of Toronto | Tate, Zeb | Attended |
| University of Toronto | Li, Xiaoguang | Attended |
| Wind Logics | Coriale, Mike | Attended |
| Windrush Energy | J.C. Pennie | Attended |
| IESO | Falvo, Mike | Attended |
| IESO | Finkbeiner, Darren | Attended |
| IESO | Freire, Joseph | Attended |
| IESO | Huber, Devon | Attended |
| IESO | Khan, Khaqan | Attended |
| IESO | Penic, Jordan | Attended |
| IESO | Shoukri, Dina | Attended |
| IESO | Springgay, Guy | Attended |
| IESO | Trickey, Candice | Attended |
| Scribe: Dina Shoukri, IESO. Please report any corrections, additions or deletions to the following email address: dina.shoukri@ieso.ca . | | |

All meeting material is available on the IESO web site at:
http://www.ieso.ca/imoweb/consult/consult_windpower-sc.asp

Document output of each agenda item below:

Item 1 Welcome and Introductions

Khaqan Khan (IESO) welcomed the group and reviewed the objectives of the Wind Power Standing Committee. Members introduced themselves.

The agenda was reviewed with no additional items added.

Updates were provided on the following Action Items:

Action Item #50: This item is currently under consideration and the IESO will inform the WPSC members as to its status via email notification in the near future. Inclusion of discussions around OPA's FIT and other wind contract related issues in the WPSC forum is also dependent on action item #55. This action item will remain open for the time being.

Action Item #52: OPA has provided an email response to this action item stating that the Bruce to Milton Transmission Reinforcement project will make available approximately 1,200 MW of area capability in the Bruce area, and approximately 300 MW of capability in the area west of London. Response further states that on September 17th, 2010, the Minister of Energy directed the OPA to hold in reserve 500 MW of transmission capacity to be made available in the Bruce area in anticipation of the completion of the Bruce-Milton Transmission Reinforcement for Phase 2 projects of the Korean Consortium or its Project Companies. It is anticipated that all of the remaining capacity will be allocated during the Individual Project Assessment (IPA) stage beginning at the start of the ECT. This action item is closed.

Action Item #53: Darren Finkbeiner suggested that this item remain open, however related questions could be asked during his presentation re: "Status Update on Renewable and Embedded Generation Initiatives."

Action Item #54: This item continues to be a work in progress. The IESO is currently developing a control actions list to be used at times of surplus baseload generation (SBG). Items that are currently being discussed in control action list are the forecasting of SBG (at t-72 or t-48 etc.), communication to market participants, import curtailments etc. Once the control action list is developed and complete, it shall be shared with the public and at such time, this action item will be closed.

Action Item #55: This item is under consideration with IESO management. It is the intention of the IESO that the title and scope of WPSC will be expanded to include all renewable variable generation – solar, wind and run of the river hydro. Once decision is approved and finalized by the IESO management, the committee's new name and scope will be formally communicated to the group via email.

Item 2 Status Update on Renewables and Embedded Generation Initiatives

Darren Finkbeiner of the IESO provided an update on the policy decisions being finalized in regards to the growing contribution of renewables and embedded generation. Key focus areas for policy decisions were forecasting, visibility and dispatch. He further explained that some of the considerations were captured in the presentation while others will be stakeholdered at a later date. The IESO is having internal discussion on the merit order dispatch item and the generator pay model for Centralized Forecasting is being finalized.

Member Questions, Comments and Discussion:

- A member wished to understand how the total amount of installed and contract wind generation was divided between embedded and directly connected resources. It was noted that a fair estimate of breakdown of these resources is available in OPA's 2010-second quarter progress report.
- A question was raised whether the forecasts for embedded generation should be treated differently than the forecast for directly connected generation when it comes to forecasting primary demand. Assurances were provided that the impact of embedded generation on forecasting primary demand would be considered. It was noted that NERC Integration of Variable Generation Task Force (IVGTF) is proposing that embedded generation's impact be considered in net load, i.e. as a reduction to primary demand.
- A member wished clarification on whether or not their OPA contracts would provide them with monetary compensation for any dispatches followed for a local issue such as a surplus condition specific to the northwest zone of the province. The IESO is currently working with the OPA to determine what is captured under the "substantially all" language. The IESO staff did however articulate its current thoughts that as a matter of equitable treatment congestion management settlement credits (CMSC) should be available for all dispatchable resources including FiT where they respond to dispatch and CMSC is appropriate.
- A member inquired as to why the IESO intended to request visibility of plant level data for embedded generators 5 MW or greater rather than Local Distribution Company (LDC) level data. The concern was around the fact that an LDC may have a number of generators each less than 5 MW but whose total may be impactful. The IESO indicated that at this time, based on data from the OPA, output from generators less than 5 MW do not appear to be a significant magnitude to drive our operations significantly askew. If that were to change in the future, the 5 MW plant threshold would be re-visited.
- An LDC representative inquired as to what extent the IESO plans to dispatch at the LDC level. The IESO assured the member that there is no need at this time for embedded generation to alter its output in order to meet demand or balance the system. However, it was also noted that if circumstances change and the IESO did require more frequent dispatch capabilities, the relationship between LDCs and the IESO would need to change from what it is today. This would be necessary to ensure quick and efficient dispatches. The IESO does not manage the distribution system, however obligations will continue to exist where for reliability reasons the IESO may direct embedded facilities to vary output or connection via the LDC. It was also stated that if conditions change (i.e. significant increased levels of embedded generation investment), additional protocols could be developed to respond to these changing conditions.
- A member inquired as to what percentage of installed wind capacity does the IESO carry as spinning operating reserve to compensate for the variability of the resource. The IESO indicated that the amount of spinning reserve carried is based on the Northeast Power Coordinating Council Inc. (NPCC) criteria of 25% of the total 10 minute reserve requirement (single largest contingency). Currently, the amount of reserves carried is not based on the amount of installed wind capacity available on the system. That said, the IESO, in conjunction with the NERC IVGTF is currently reviewing the potential need for new standards to be developed to address the

impacts of large penetration of installed wind capacity on reserve requirements. Questions are currently being asked in regards to the amount of operating reserve required, spinning reserves required, regulation required etc...

- A member inquired as to whether or not centralized wind forecast data, once implemented, would be made publically available. The IESO's expectation is that it will be made public but to what granularity is currently unknown. It may be facility specific or regional. Actual wind production outputs are currently available by resource, after the fact.
- A member asked why energy storage is not being suggested to assist with dispatch issues. The IESO agreed that while storage does have a number of beneficial characteristics, it would have to become part of the supply mix strategy which is developed by the OPA. Cost benefit analysis of supply mix options is what yields the right decision and there may be more economically viable solutions. The IESO indicated that the lack of additional storage would not impact the IESO's ability to manage the system in a reliable fashion. The availability of additional storage merely displaces the need for other resources to be dispatched. A representative from the OPA confirmed that storage solutions are being looked at as a potential piece of the supply mix and that pilots in neighbouring jurisdictions are being used to learn functionality. It was said that from what they've observed, smaller storage facilities are more often used for regulation purposes rather than consumption during low demand periods. The OPA further stated that although the technology is being reviewed, economics is a large factor and they want to ensure that the solution decided upon is the best option for the province.
- A member suggested that Ontario should also benefit from National Institute of Standards and Technology (NIST) developments on variable generation related standards and technologies.
- A member asked whether or not any thought had be given to creating a market for curtailments rather than mandating that all resources are required to respond to dispatches. The IESO's goal is for fairness and to not treat variable generation any different than other generators. Currently, the IESO has a 5-minute dispatch process based on the economics of their submitted offers. The IESO is currently reviewing the need for a merit order policy during certain situations that would use additional factors beyond the offers and bids submitted by participants. The Dispatch Scheduling and Optimization (DSO) program does not have enough future outlook to make the best decision for every circumstance. One example is if there was a 2 hour surplus baseload generation problem, shutting down a nuclear unit for 3 days may not make the most sense. The DSO cannot measure long term, environmental and other impacts. The inclusion of all these considerations will go into the development of the merit order policy, as will public consultation with relevant parties. The IESO also noted that all resources are currently obligated to curtail their output for reliability reasons.
- A member directed a question to the OPA and asked if dispatch flexibility is an assessment criteria used for their different supply mix possibilities. The OPA replied in the affirmative and noted that dispatch flexibility is one of many issues taken into consideration when formulating the province's future supply mix. OPA's biggest concern, however, is around the uncertainty of the nuclear fleet and transmission projects. It is those decisions that are required.

Item 3 Solar and Photovoltaic Forecasting

Sophie Pelland of Natural Resources Canada provided a presentation on solar and photovoltaic forecasting in Canada. The presentation provided insight into how photovoltaic forecasts are generated and how solar and photovoltaic forecasting is done in both Canada and internationally.

Member Questions, Comments and Discussion:

- A member inquired as to why there remains a persistence bias and why that is not corrected for. It was indicated that this was a work in progress and the goal is to in fact remove said bias.
- Further questions were asked around time correction and if it was known how much of the forecasting error was actually due to a time delay associated with the transmittal/receipt of the data snapshot. It was indicated that this information was not available as that assessment had not been made.
- A member inquired if there was a minimum geographic size that the analysis presented applies to. It was indicated that methodology should not change for a smaller size however larger PV farms use multiple inverters and transformers which may create an added layer of complexity.
- Further question was asked in regards to the type of power fluctuation that can be expected on a local system. The Utility Wind Integration Group in the USA is currently investigating these issues. With Natural Resources Canada's one minute data, it is possible that they undertake a variability analysis study to do a more specific local variability analysis.
- A member commented on the fact that the true forecast error stems from the meteorological forecast. As such the measure of error should be based on the weather forecast rather than the power output forecast. Natural Resources Canada agrees and are currently working on methods to improve the information received from Environment Canada.
- A member inquired as to what preferred measure of error is, bias vs. RMSE, and it was indicated that both are good and there was no preference.

Item 4 Study on Evaluating Potential for Solar PV in Ontario

Khaqan Khan of the IESO provided an update on the joint study between the IESO and the OPA on Operation and Potential for Solar Photovoltaic Power (PV) in Ontario. The background and proposed RFP are based on the requirement outlined in the Green Energy Act. The end deliverables shall apply to both ground mounted and roof top solar facilities and the service provider will be required to develop time series production data on both an hourly and ten minute basis. These shall be based on 10 year historical data. Profiles shall be submitted on a site specific and IESO zone specific basis. Once solar PV potential and data is identified and data submitted by service provider, the results of this study will eventually enable **the IESO & OPA** to assess the system impacts of incorporating large amounts of solar PV into the Ontario electricity system and facilitate an effective implementation of FIT. Study is expected to be complete by the end of the year and the IESO plans to continue to take feedback from the WPSC.

Member Questions, Comments and Discussion:

- Questions around whether or not the study would be made public upon its completion could not be answered as that decision has not yet been made. Currently the intention is to eventually make it public at some later stage.
- A member asked how the 10 minute timeframe was selected. It was explained that the 10 minute time frame is very important to the IESO as a system operator. Operating reserves are carried for a 10 minute period and thus understanding variability on a 10 minute basis becomes important. The more granular the better however a minimum of 10 minutes is needed.

Item 5 Feed-in-Tariff related Transmission Planning Reforms

Tracy Garner of the OPA presented an update of renewable resource development, including the FIT program, the available transmission capability and the economic connection test (ECT) process, near term transmission development initiatives, as well as other planning and transmission development process considerations.

Member Questions, Comments and Discussion:

- Confirmation was made that the initiation of new transmission programs will commence once the OPA has delivered the ECT report to the OEB. The ECT priority list is expected to be made public once complete.
- A member inquired as to whether or not additional applications could be submitted despite the fact that the published deadline for the ECT on the OPA website was June 4th. Confirmation was given that although applications can still be submitted, those received after the June 4th deadline will not be included in the first ECT but instead will be included in the next phase.
- A member, referencing the Minister's May 7, 2010 order for a "Samsung ready plan" by July 11, 2010, noted that that deadline had passed and wished to know when this plan can be expected. The OPA noted that it was unable to comment at this time.
- A member inquired as to how the Bruce x Milton transmission expansion was being treated during the ECT process. Members were informed that it is recognized that the Bruce x Milton enhancement has not yet received all the necessary approvals, specifically those from the Niagara Escarpment Commission, and that the affected applications will be awarded contracts only when all those approvals have been granted.
- When asked why the 5% congestion measure is used on major transmission lines but not radial transmission lines, the OPA informed the members that this was a not a topic that could be discussed today however referenced to an OPA presentation that did explain this item which was presented on May 13, 2010 WPSC meeting.
- A member inquired as to how long it would take for those who passed the ECT to come into service. It was indicated that some projects will need minor enhancements allowing to connect relatively quickly while those who require major enhancements could take significantly longer.

Item 6 OEB Related Updates: Transmission Planning Reforms

Laurie Reid of the Ontario Energy Board (OEB) provided an overview of how the transmission project development takes place from site identification, transmitter designation, construction to rate recovery.

Member Questions, Comments and Discussion:

- A member inquired as to how multiple applicants would be treated during the designation process. The OEB indicated that as they have no experience with multiple applicants the details of how that hearing would occur still needs to be determined. They are also yet to decide on whether they would hold multiple designation hearings simultaneously. The OEB is awaiting the results of the first ECT before determining the most efficient way to move forward.
- A member asked whether or not new transmission projects would be prioritized in term of reliability. It was stated that the Board's primary objective is reliability. One aspect of the Integrated Power System Plan (IPSP) was to introduce transmission project planning issue that relate to reliability. The previous IPSP did mention a potential need to enhance service to downtown Toronto however transmitters are responsible for reliability in their own systems and should designate reliability projects during their rate hearing. The OPA is required to file a new IPSP but at this time there is nothing in the queue from the OPA in regards to reliability transmission planning.
- Questions around expectations of transmitters were asked. The OEB is not insisting that any pre-arrangement be made with affected parties prior to filing an application; however, having those pre-arrangements would be an asset. Similarly, transmitters are not required to have operational or construction experience however having operational experience is an asset, as would having construction experience.

Item 7 Future Potential Additional Items

- The IESO was first commended for the publication of generator specific wind output data however a member inquired as to whether or not it would be possible to somehow indicate with that data when output changed as a result of a dispatch. In response it was suggested that this issue should be raised in Stakeholder Engagement 57 rather than in this forum.
- A member inquired as to how all the potential changes addressed by Darren Finkbeiner's morning presentation would be stakeholdered. They were informed proposed changes are expected to be addressed through Stakeholder Engagement 57.
- A member requested if generator output data could be aggregated monthly rather than hourly. As the decision for the data to be made hourly was to provide participants with the flexibility to aggregate as they wish, the data will not be modified to a less granular level.

Additional Items for Future Meetings Requested:

- Turbine Manufacturers to present emerging turbine technologies
- More information on visibility requirements as they are developed
- Contracted and other variable generation proponents (especially solar) currently in service to speak to how the system is working from their perspective today.

| Action Item Summary | | | | |
|---------------------|-------------------|---|--------|---|
| # | Date | Action | Status | Comments |
| 50 | November 19, 2009 | IESO to forward OPA's recommendation to the IESO management (re: moving forward OPA's FIT and other wind contract related issues should also be discussed and resolved through WPSC forum) | Open | |
| 52 | May 13, 2010 | OPA to provide information to WPSC members regarding availability and capacity allocation of 230 kV and 500 kV Bruce Milton lines for FiT generation. | Closed | See Agenda Item 1, Action item review #54 |
| 53 | May 13, 2010 | IESO to inform wind developers about meteorological tower requirements in near future to enable them to include these requirements for advance business planning. | Open | |
| 54 | May 13, 2010 | IESO to consider the provision of more market data around actions taken during SBG. | Open | |
| 55 | May 13, 2010 | IESO to forward members' recommendations and suggestions to the IESO management (re: addressing solar PV integration issues in either existing WPSC forum by expanding its title and scope, or through a separate "solar integration" stakeholder forum.) | Open | |